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Editorial

Energy Dissipation Systems for Seismic Vibration-Induced Damage Mitigation in Building Structures: Development, Modeling, Analysis, and Design

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One of the main challenges in today's civil/earthquake engineering is the effective mitigation and control of damage due to earthquake-induced vibrations, with the aim of safer structures, thus satisfying society expectations. Since the mid XX century, passive, semiactive, and active controlled systems have been proposed, tested, studied, and optimized to mitigate earthquake-induced effects upon structures. Their effectiveness in reducing structural vibrations and damage is nowadays worldwide recognized. Nonetheless, despite the large amount of research effort, the practical implementation of innovative seismic protection devices in building structures is still limited to only few countries (such as USA, Japan, and Italy).

This Special Issue is thus devoted to energy dissipation systems, with particular emphasis to modeling issues, design aspects, numerical simulations, control strategies, and experimental studies.

The works published in this Special Issue introduce to the researchers community some remarkable novelty. The five valuable contributions have been selected to cover all the main themes of the topic, including the studies of various devices such as fluid viscous dampers (X. He et al., China), semiactive control devices (N. Caterino et al., Italy, K. Hiramoto et al., Japan), lead shear dampers (B. Wang et al., China), and tuned liquid column dampers (Y. Yu et al., China).

N. Caterino et al. in "Experimental Assessment of a Skyhook Semiactive Strategy for Seismic Vibration Control of a Steel Structure" investigated the benefits of semiactive (SA) sky hook (SH) dampers for seismic protection of a two-storey steel frame via shaking table tests. The control strategy is particularly effective for reducing the floor acceleration, thus achieving high seismic protection for nonstructural components and contents.

B. Wang et al. in "Mechanical Performance and Design Method of Improved Lead Shear Damper with Long Stroke" present an experimental study on an improved plate lead shear damper with long stroke (ILSD-LS) developed to meet the engineering requirements for high rise structures with long periods subjected to far-field earthquakes. The numerical results indicate that the devices can effectively control the deformation and reduce damage.

K. Hiramoto et al. in "Adaptive Gain Scheduled Semiactive Vibration Control Using a Neural Network" propose an adaptive gain scheduled semiactive control method using an artificial neural network for structural systems subject to earthquake disturbance. The proposed design method is applied to the semiactive control design of a base-isolated building with a semiactive damper. Compared to the passive control case and the conventional semiactive control method based on the clipped optimal control method, the proposed semiactive control method is shown to have better control performance on vibration suppression and flexibility against earthquake disturbances whose time and frequency characteristics are unknown over the conventional semiactive control approach, aiming at the robust performance characteristics.

X. He et al. in "Research on Fluid Viscous Damper Parameters of Cable-stayed Bridge in Northwest China" investigate the seismic response of an existing bridge located in North West China, by means of numerical simulations. The results indicate that seismic response can be reduced by installing longitudinal nonlinear fluid viscos dampers (FVD) between the towers and the girders. The simulations have been performed to determine the optimal dampers parameters.

Y. Yu et al. in "Experimental Study on Variation Rules of Damping with Influential Factors of Tuned Liquid Column Damper" investigated the response of tuned liquid column damper (TLCD) through experimental tests. TLCD devices are used for the motion suppression of floating platforms. A specific vibration testing system on land was developed to satisfy the requirements of off-shore float platforms with low-frequency and large amplitude. In detail, based on the experimental method of uniform design, a series of experimental tests were conducted to determine the quantitative relationship between the head loss coefficient and other factors.

In summary, this Special Issue provides a snapshot of the up-to-date energy dissipation systems which could represent a valuable reference for both academic and technical readers.

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